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Committee on the Peaceful Uses of Outer Space

International cooperation in the peaceful uses of outer space: activities of Member States

Note by the Secretariat

Addendum

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I. Introduction

1. In the report on its fifty-second session, the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space recommended that the Secretariat continue to invite Member States to submit annual reports on their space activities (A/AC.105/1088, para. 27).

2. In a note verbale dated 27 July 2015, the Secretary-General invited Member States to submit their reports by 19 October 2015. The present note was prepared by the Secretariat on the basis of reports received in response to that invitation.

II. Replies received from Member States

Armenia

[Original: English]
[19 October 2015]

Activities linked to the peaceful uses of space at the Byurakan Observatory of the Academy of Sciences of Armenia

In 2014, an observational module was installed at the Saravand base of the Byurakan Observatory of the Academy of Sciences of Armenia, comprised of our EOP-1 telescopes produced in the Russian Federation, which is specialized in near-Earth space complex optical observations. The diameter of the mirror of the biggest telescope is 40 centimetres. With the help of these telescopes, within the framework of the Armenian-Russian intergovernmental agreement, monitoring, determining the orbits of space debris fragments and their inclusion in relevant lists are being done. Armenian and Russian observers are involved in the process.

To enhance the quality of these activities, the department of applied astronomy was created at the observatory, which is implementing the above-mentioned programme. The infrastructure, including the buildings and working and living conditions of the employees are currently being improved.

In the near future a Zeiss-600 telescope, which cannot currently be used, is planned to be redeployed at the Observatory. For it to be used, a relevant secondary mirror should be installed, telescope axes should be improved to working conditions and electric motors should be supplemented, which will enable to control the telescope's positioning by computer. In that case, the telescope can be used not only in the main programmes for space exploration, but also in the programme for monitoring of space debris.

The intergovernmental agreement also stipulates that a certain amount of time on the ZTA-2.6 and AZT-10 telescopes should be set aside for a space debris monitoring project, which will make it possible to discover more small metal fragments, which cannot be discovered with the EOP-1 module.

Denmark

[Original: English]
[10 November 2015]

Annual report on space activities for Denmark, 2014

Denmark is a party to four of the five United Nations treaties on outer space: the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (Outer Space Treaty) of 1967; the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (Rescue Agreement) of 1968; the Convention on International Liability for Damage Caused by Space Objects (Liability Convention) of 1972; and the Convention on Registration of Objects Launched into Outer Space (Registration Convention) of 1976. Denmark has, however, never implemented them in national law.

On 8 May 2015 the Minister for Education and Science was appointed responsible for outer space affairs in Denmark and hence responsible for implementing the above-mentioned treaties and conventions in national law. The Government of Denmark anticipates that the relevant law will take effect in mid-2016. Since Denmark had no national space authority before May 2015, it was not in a position to authorize or systematically register space activities before that.

A provisional act made it possible for Denmark to authorize some specific space activities in 2015 related to the launch of a Danish CubeSat (AAUSAT5) in connection with Danish European Space Agency (ESA) astronaut Andreas Mogensen's flight to the International Space Station in September 2015. This will be covered in Denmark's annual report for 2015.

Space activities in 2014

Denmark knows of only one attempted space activity in 2014. The activity was not formally authorized, since no national space authority had been appointed at the time.

The GOMX-2 satellite from GomSpace was a 2U (unit) CubeSat built to flight-qualify a new high-speed ultra-high frequency UHF transceiver and software-defined radio receiver and to test a new deorbiting system made by Aalborg University. On board was also an optical communication experiment from the National University of Singapore. GOMX-2 was launched on 28 October 2014 by an Orbital Sciences Antares rocket on board the Cygnus CRS-3 cargo vehicle towards the International Space Station and was to be deployed from the Japanese airlock. The Antares rocket, however, suffered a fatal anomaly during launch from pad 0A of the mid-Atlantic regional spaceport at Wallops Flight Facility of the National Aeronautics and Space Administration, in Virginia, United States of America. The satellite was subsequently recovered from the wreckage and sent back to GomSpace in Denmark, which has tested it and can conclude that it still works flawlessly. The GOMX-2 was the only still-functioning payload from the Antares anomaly.

The Danish authorities are not aware of any plans to fly the satellite on another launch opportunity.

Danish Agency for Science, Technology and Innovation national research on space debris, the safety of space objects with nuclear power sources on board and problems relating to their collision with space debris

In 2014 Denmark did not conduct any national research on space debris, the safety of space objects with nuclear power sources or the problem of collision with space objects.

Finland

[Original: English]
[20 October 2015]

Finland considers international cooperation to be a most efficient way to foster space science, space technology and industrial cooperation. Finland focuses its efforts on involvement in European structures, in particular the European Union, the European Space Agency (ESA), the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) and European Organisation for Astronomical Research in the Southern Hemisphere (ESO). Finland has a 30-year long tradition of utilizing spacecraft for scientific purposes, and has participated in some 60 space missions, many carrying scientific payloads.

Concerning the organizational framework of its space activities, it should be noted that Finland has no national space agency. The Finnish Space Committee coordinates all space activities in Finland.

The Finnish Space Committee published the national space strategy for the period 2013-2020 on 28 February 2013. The strategy has four spearheads:

(a) Satellite data and technologies helping activities in the Arctic region;

(b) Utilizing "big data";

(c) Sustaining space-based science;

(d) Spacecraft technology industry.

The strategy focuses more on the economic, social, political and security potential of space activities and its importance for the national economy rather than on scientific research.

Finland became the thirteenth ESA member State in 1995. Finland participates in ESA optional programmes that concern especially Earth observation and space technology programmes.

Finland has been a European Union member State since 1995 and participates in European Union space programmes such as Galileo and Copernicus.

Malta

[Original: English]
[10 November 2015]

The following is information on the space research and projects of Malta as submitted by different entities in Malta. The information provided may not represent an exhaustive list of projects being undertaken by Malta in this area.

Malta Environment and Planning Authority

In preparation for the use of space-related data, the Malta Environment and Planning Authority (MEPA) initiated a process to maximize the availability and usability of information assets that would ensure the eventual management of spatial information systems emanating from both aerial and remotely sensed data. This included the setting up of a data architecture policy in line with Government directives, which was carried out through the ongoing restructuring of the Information Resources data in line with Infrastructure for Spatial Information in the European Community (INSPIRE) metadata for MEPA-wide use through a Shared Environmental Information System structure. The coordination of information on the environment (CORINE) land cover updates were instrumental in acquiring access to remote data, training users on the process and enabling analytical output.

Malta, through MEPA, undertook to integrate the requirements of international activities and prepare a physical structure for data collection, input, storage, analysis and dissemination. Such a structure was created through the acquisition of European Regional Development Fund funds through a project entitled "Developing national environmental monitoring infrastructure and capacity", which complied with the requirements for European Environment Agency data flows thanks to its remit to establish monitoring networks in line with European Environment Information and Observation Network requirements. This process ensured the free dissemination of data to the public, inclusive of spatial, environmental and physical data, in accordance with the Aarhus requirements, the structures of which were built in accordance with the Implementing Rules of the INSPIRE directive; it will have its own shared information systems. The initiative was based on the concept that the thematic disciplines will have available a comprehensive infrastructure that will enable non-governmental organizations, academia and the general public to upload thematic data and carry out cross-thematic analysis without the need to create their own systems.

University of Malta

The Institute of Space Sciences and Astronomy at the University of Malta plays a significant role in the development of instruments for astronomical and cosmological measurements from space, specifically in the Euclid mission and the Square Kilometre Array.

The Institute specializes in the development of image-processing techniques to measure the shapes of galaxies from space, and in collaboration with the University of Oxford (United Kingdom of Great Britain and Northern Ireland), the Netherlands Institute for Radio Astronomy and Medicina Radio Observatory (Italy), it develops digital signal-processing instruments for electronic steering, imaging and calibration

of radio telescopes. These instruments, which are mainly software-based, have also been applied to the tracking of space debris and satellites, and by using new, multipixel, broad bandwidth techniques, the capability of orbital speed and position has been added. Using these techniques in combination with large phased arrays may provide additional capabilities to single-receiver radar methods.

The Physical Oceanography Research Group within the Department of Geosciences of the Faculty of Science of the University of Malta is involved in various research activities and also provides scientific services related to environmental monitoring, satellite communication, disaster risk reduction and the use of global navigation satellite systems. The Group undertakes oceanographic research, from a holistic perspective, including operational observations and forecasts, specialized data management analysis and participation in international cooperative ventures. The overarching research themes cover coastal meteorology, hydrography and physical oceanography, with a main emphasis on the experimental study of the hydrodynamics of the sea in the vicinity of the Maltese islands.

The Group has mainly endeavoured to promote activities in operational oceanography through the installation and maintenance of permanent sea-monitoring systems and the provision of meteorological marine forecasts. Work on oil-spill modelling has placed the Group in a high-profile position within the international community in this field, and is also opening the way for the involvement of Malta in national contingency planning and networking with local agencies responsible for oil-spill response. In particular, the Malta MEDSLIK oil-spill model provides a system to forecast oil-slick movements in the Malta Channel, in the area just south of the islands and near the coastal areas. Our model is capable of predicting with precision the track of the spill from an open-sea source to near shore and coastal areas. This service falls within the ambit of the national team for emergency response to oil-spill incidents under the direction of Transport Malta. Raw SAR data over the region of interest, which are captured by the Sentinel-1 satellite, are downloaded, geo-referenced and analysed for oil spills close to the Maltese islands. Any detected spills are mathematically defined and provided as input to the model to be able to forecast the outcome and corresponding trajectory.

Through the CALYPSO and CALYPSO Follow On projects, the Physical Oceanography Research Group installed a permanent and fully operational high-frequency (HF) radar observing system, capable of recording (in real time with hourly updates) surface currents in the Malta Channel. The system consists of radial sites to the north of Malta and southern Sicilian shores at selected sites, as well as a combining station to develop and publish data for users. The consortiums of such projects included research entities and also public entities with responsibilities for civil and environmental protection, surveillance, security and response to hazards. Collected data, combined with numerical models, are intended to primarily support applications to optimize intervention in response to oil spills, as well as provide tools for search and rescue, security, safer navigation, improved meteorological marine forecasts, monitoring of sea conditions in critical areas, such as in proximity to ports, and better management of the marine space between Malta and Sicily. To validate the HF radar data, a number of Iridium Surface Velocity Profiler drifters were deployed in the Malta Channel between December 2012 and March 2014 at stations along a transect between Gozo and the southern Sicilian coast.

The Institute of Earth Systems at the University of Malta is engaged in a number of projects on the use of space satellite data. In relation to planetary studies, a relatively unexplored area of the lunar surface was studied (6.62 latitude and -29.89 longitude). Land-based charge-coupled device observations of this area showed a small group of domelike structures situated on an elevated basaltic platform. Lunar reconnaissance orbiter data and Clementine mission data were used for terrain and spectrometric analysis of the Moon surface.

With respect to a further initiative, sophisticated numerical weather prediction models are used to improve weather forecasting for the Maltese islands. Default model surface details representing the Maltese islands contain data irregularities that limit the accuracy of the numerical model output. Research on numerical weather prediction was aimed at improving these surface model details by improving the land-use categories on the basis of space imagery and identifying any significant improvement to weather forecasts made thereafter.

The Institute has also conducted research on the relation between various physicochemical parameters and the growth of phytoplankton in Maltese coastal waters. Results were accomplished through the use of in situ and satellite remote sensing. The use of remote sensing data was featured in other projects, such as the erodibility analysis of valley catchment systems in the Maltese islands. In this case, data collection primarily resorted to space satellite (IKONOS high resolution satellite sensor) and aerial reconnaissance (aerial photography and light detection and ranging) data, and the data were analysed using geographical information system tools.

Further research by this Institute, within Malta and beyond, covers the current heat island effect and its implications for dense urban areas, baseline studies of dune stability, exposure to harmful solar ultraviolet radiation, and the study of the relationship between trends in ozone and phytoplankton concentration.

Turkey

[Original: English]
[13 November 2015]

International cooperation in outer space

For many States, the socioeconomic benefits of space activities reveal the need for increasing national capacity and advancing international cooperation. The sustainability of space activities is another factor that compels further international cooperation between States.

In this regard, Turkey attaches importance to active engagement in the current international cooperation mechanisms in the peaceful uses of space.

Turkey is a State party to the five United Nations treaties on outer space. Besides its bilateral cooperation agreements, Turkey also has regional cooperation agreements with relevant actors, such as the European Space Agency and the Asia-Pacific Space Cooperation Organization.

Turkey has no space objects with nuclear power on board.

Asia-Pacific Space Cooperation Organization

With the development of space technology and its applications, more space activities have been carried out by spacefaring countries in the world. Those space activities are faced with a series of legal issues. The Asia-Pacific Space Cooperation Organization (APSCO), as a multilateral intergovernmental organization, has the indispensable duty not only to promote regional space cooperation activities, but also to enhance the capacity-building of member States in space law and research on related legal issues and policy. Turkey is one of the founding members of APSCO. In this respect, the Space Technologies Research Institute (TÜBİTAK UZAY) follows the forums, workshops and training events organized by APSCO in the field of space law and policy.

The 2015 APSCO Space Law and Policy Forum was held in Beijing from 21 to 23 September, jointly organized by APSCO and the Beijing Institute of Technology. The opening ceremony was attended by Niklas Hedman from the Office for Outer Space Affairs of the Secretariat, Ma Xinmin from the Ministry of Foreign Affairs of China, Zhao Jian from the China National Space Administration (CNSA), Li Xinjun from APSCO and Zhang Wei from the Beijing Institute of Technology. Li Xinjun, Acting Secretary-General of APSCO, welcomed all the participants of the forum on behalf of APSCO.

The APSCO Space Law and Policy Forum held four technical meetings with 19 presentations and a panel discussion on legal challenges faced by regional or international organizations. The presentations covered the areas of development of space law and related issues; national space law and policies of Asia-Pacific States; space law and policy in facilitating international and regional cooperation; and the development and future of regional and international organizations.

The APSCO Training Course on Space Law and Policy, jointly organized by APSCO and the Regional Centre for Space Science and Technology Education for Asia and the Pacific, was successfully held in Beijing from 17 to 25 September 2015.

European Space Agency, European Centre for Space Law

There was participation in the twenty-fourth European Centre for Space Law summer course on space law and policy, held in partnership with the University of Caen Basse-Normandie in Caen, France, from 31 August to 11 September 2015.

Multilateral negotiations on an international code of conduct for outer space activities

There was participation in the multilateral negotiations on an international code of conduct for outer space activities, held in New York from 27 to 31 July 2015. The meeting was organized by the European Union with the assistance of the Office for Disarmament Affairs of the Secretariat.

European Union research and innovation programme

TÜBİTAK UZAY was one of the partners involved in a project called Prediction, Protection and Reduction of Orbital Exposure to Collision Threats (P2-ROTECT). The project was funded by the European Union in the framework

of its research and innovation funding programme for 2007-2013 (the Seventh Framework Programme), in the activity area on the security of space assets from on-orbit collisions, and lasted from March 2011 to September 2013. The aim was to assess the risk caused both by trackable and untrackable space debris and to identify the most efficient ways of reducing the effect of space debris in different orbits.

Methods used for dealing with space debris can be summarized as follows: improvement of collision prediction, better protection of spacecraft and better debris removal. A vulnerability index has been defined for evaluating how efficient proposed solutions against trackable and untrackable debris are; the efficiency and cost of possible solutions to protect space systems and infrastructures are analysed together to find the most suitable solution.

Space debris in different orbits has different densities and characteristics. Three space programmes were investigated in the project to be able to analyse the effects of space debris in each orbit: Sentinel-1 in low-Earth orbit, the European Satellite Navigation System (Galileo) constellation in medium Earth orbit and the Meteosat third generation weather satellite in geostationary orbit.

Possible solutions regarding space debris were analysed and new methods were proposed in the project. The methods have to do with spacecraft (better protection of spacecraft against collisions, redundancy and better design), missions (fractionated mission design, different missions sharing satellites for specific functions, etc.) and ground-control (better prediction of collision risk at the mission planning stage, planning manoeuvres, etc.).

TÜBİTAK UZAY contributed to the project in the areas of improving ground operations, designing fractionated satellite architectures and designing a sensor for debris observations in space and self-avoidance of satellites against debris. For detailed information, see: www.p2rotect-fp7.eu/.

Activities of TURKSAT

The promotion of a domestic space industry and satellite technology is one of the cornerstones of the space policy of Turkey. As part of this vision, Turkey is a member of the International Telecommunications Satellite Organization and the European Telecommunications Satellite Organization.

The TURKSAT Satellite Communications and Cable Television Operations Company (TURKSAT AS) is the only communications satellite operator in Turkey. TURKSAT-1B, Turkey's first satellite, successfully provided services from 1994 to 2006 and TURKSAT-1C, the second satellite of the first generation, provided services from July 1996 to September 2010. TURKSAT currently manages and operates four satellites, namely TURKSAT-2A, TURKSAT-3A, TURKSAT-4A and TURKSAT-4B, which was launched in October 2015.

TURKSAT AS is a member of the Europe, Middle East and Africa Satellite Operators Association.